

Appln No. 09/711,648
Amdt date October 1, 2003
Reply to Office action of July 14, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An injection catheter comprising:
a catheter body comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough;
a tip section comprising a flexible tubing having proximal and distal ends, wherein the proximal end of the tip section is mounted at the distal end of the catheter body;
a needle control handle at the proximal end of the catheter body;
an injection needle extending through the tip section, catheter body, and needle control handle and having a proximal end attached to the needle control handle and a distal end within the tip section, wherein the injection needle is longitudinally slidable within the tip section so that its distal end can extend out the distal end of the ~~[catheter]~~ tip section upon suitable manipulation of the needle control handle; and
an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

2. (Original) An injection catheter according to claim 1, wherein the first end of the electrode lead wire is connected near the proximal end of the injection needle.

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3. (Original) An injection catheter according to claim 1, wherein the first end of the electrode lead wire is connected near the distal end of the injection needle.

4. (Original) An injection catheter according to claim 3, wherein the electrode lead wire comprises a pair of wires including a copper wire and a constantan wire that can act as a thermocouple.

5. (Original) An injection catheter according to claim 1, further comprising a protective tube in surrounding relation to at least a portion of the injection needle.

6. (Original) An injection catheter according to claim 5, wherein the protective tube surrounds the injection needle along substantially the entire length of the needle.

7. (Original) An injection catheter according to claim 1, further comprising at least one additional electrode mounted on the tip section.

8. (Original) An injection catheter according to claim 1, further comprising a tip electrode mounted on the distal end of tip section.

9. (Currently Amended) An injection catheter comprising:
a catheter body comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough;

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a tip section comprising a flexible tubing having proximal and distal ends, wherein the proximal end of the tip section is mounted at the distal end of the catheter body;

a needle control handle at the proximal end of the catheter body;

an injection needle extending through the tip section, catheter body, and needle control handle and having a proximal end attached to the needle control handle and a distal end within the tip section, wherein the injection needle is longitudinally slidable within the tip section so that its distal end can extend out the distal end of the ~~[catheter]~~ tip section upon suitable manipulation of the needle control handle;

an electrode mounted on the injection needle near the distal end of the injection needle and electrically isolated from the injection needle;

an electrode lead wire having a first end electrically connected to the electrode and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

10. (Original) An injection catheter according to claim 9, wherein the electrode is in the form of a ring mounted in surrounding relation to the injection needle.

11. (Original) An injection catheter according to claim 9, further comprising an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

12. (Original) A method for introducing a therapeutic or diagnostic agent into heart tissue of a patient comprising:

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introducing the distal end of a catheter according to claim 1 into the patient's heart;

extending the injection needle beyond the distal end of the tip section;

determining whether the injection needle has penetrated the heart tissue;

and

injecting a therapeutic or diagnostic agent into the heart tissue with the injection needle.

13. (Original) A method according to claim 12, wherein the determining step comprises measuring the impedance across the distal end of the injection needle.

14. (Original) A method according to claim 12, wherein the catheter further comprises at least one additional electrode at or near the distal end of the tip section.

15. (Original) A method according to claim 14, wherein the determining step comprises comparing the impedance across the distal end of the injection needle to the impedance across the additional electrode.

16. (Original) A method according to claim 12, wherein the therapeutic or diagnostic agent is selected from the group consisting of angiogenesis activators, angiogenesis inhibitors, and antiarrhythmic drugs.

17. (Original) A method for introducing a therapeutic or diagnostic agent into heart tissue of a patient comprising:

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introducing the distal end of a catheter according to claim 9 into the patient's heart;

extending the injection needle beyond the distal end of the tip section;

determining whether the injection needle has penetrated the heart tissue;

and

injecting a therapeutic or diagnostic agent into the heart tissue with the injection needle.

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B 18. (Original) A method according to claim 17, wherein the determining step comprises measuring the impedance across the electrode mounted on the injection needle.

19. (Original) A method according to claim 17, whether the catheter further comprises at least one additional electrode at or near the distal end of the tip section.

20. (Original) A method according to claim 19, wherein the determining step comprises comparing the impedance across the electrode mounted on the injection needle to the impedance across the additional electrode.

21. (Previously presented) An injection catheter according to claim 1, wherein the injection needle extends out the distal end of the catheter in a direction generally parallel to the axis of the catheter body.

22. (Previously presented) An injection catheter according to claim 9, wherein the injection needle extends out the distal end of the catheter in a direction generally parallel to the axis of the catheter body.

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23. (Currently Amended) An injection catheter comprising:

a catheter body comprising a flexible tubing having proximal and distal ends and at least one lumen therethrough;

a needle control handle at the proximal end of the catheter body;

an injection needle extending through the catheter body and needle control handle and having a proximal end attached to the needle control handle and a distal end within the distal end of the catheter body, wherein the injection needle is longitudinally slidable within the catheter body so that its distal end can extend out the distal end of the catheter body upon suitable manipulation of the needle control handle; and

an electrode lead wire having a first end electrically connected to the injection needle and a second end electrically connected to a suitable monitoring apparatus or to a source of ablation energy.

24. (Previously presented) An injection catheter according to claim 23, wherein the first end of the electrode lead wire is connected near the proximal end of the injection needle.

25. (Previously presented) An injection catheter according to claim 23, wherein the first end of the electrode lead wire is connected near the distal end of the injection needle.

26. (Previously presented) An injection catheter according to claim 25, wherein the electrode lead wire comprises a pair of wires including a copper wire and a constantan wire that can act as a thermocouple.

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27. (Previously presented) An injection catheter according to claim 23, further comprising a protective tube in surrounding relation to at least a portion of the injection needle.

28. (Previously presented) An injection catheter according to claim 27, wherein the protective tube surrounds the injection needle along substantially the entire length of the needle.

29. (Previously presented) An injection catheter according to claim 23, wherein the injection needle extends out the distal end of the catheter in a direction generally parallel to the axis of the catheter body.

30. (New) A method for ablating heart tissue comprising:
introducing into a heart of a patient the distal end of a catheter as recited in claim 1;
introducing the distal end of the needle electrode into the heart tissue;
introducing a fluid through the needle electrode into the heart tissue; and
ablating the heart tissue with the needle electrode before, during or after introduction of the fluid.

31. (New) The method according to claim 30, wherein the heart tissue is ablated during introduction of the fluid.

32. (New) A method for ablating heart tissue comprising:
introducing into a heart of a patient the distal end of a catheter as recited in claim 9;

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introducing the distal end of the needle electrode into the heart tissue;
introducing a fluid through the needle electrode into the heart tissue; and
ablating the heart tissue with the needle electrode before, during or after
introduction of the fluid.

33. (New) The method according to claim 32, wherein the heart tissue is
ablated during introduction of the fluid.

34. (New) A method for ablating heart tissue comprising:
introducing into a heart of a patient the distal end of a catheter as recited in
claim 23;
introducing the distal end of the needle electrode into the heart tissue;
introducing a fluid through the needle electrode into the heart tissue; and
ablating the heart tissue with the needle electrode before, during or after
introduction of the fluid.

35. (New) The method according to claim 34, wherein the heart tissue is
ablated during introduction of the fluid.